UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/043,474	01/10/2002	Leonid Baraz	42390.P8254	6444

8791 7590 11/30/2005	EXAMINER
BLAKELY SOKOLOFF TAYLOR & ZAFMAN	CHOW, CHIH CHING

12400 WILSHIRE BOULEVARD	ART UNIT	PAPER NUMBER
SEVENTH FLOOR		
LOS ANGELES, CA 90025-1030	2192	

DATE MAILED: 11/30/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

		Application No.	Applicant(s)
Office Action Summary		10/043,474	BARAZ ET AL.
		Examiner	Art Unit	
		Chih-Ching Chow	2192	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on _16 September 2005_.
2a) ☐ This action is **FINAL**.　　　2b) ☒ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) _1-8,10-17 and 19-26_ is/are pending in the application.

　　4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) _1-8,10-17 and 19-26_ is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.
10) ☒ The drawing(s) filed on _08 April 2002_ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

　　Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

　　Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

　　a)☐ All　b)☐ Some * c)☐ None of:

　　　1.☐ Certified copies of the priority documents have been received.

　　　2.☐ Certified copies of the priority documents have been received in Application No. _____.

　　　3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

　　* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)
1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _5/9/02_.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1.   This action is responsive to amendment dated September 16, 2005.

2.   Per Applicants' request, independent claims 1, 10, and 19 have been amended, claims 9, 18, and 27 canceled.

3.   Claims 1-8, 10-17, 19-26 remain pending.

4.   A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 09/16/2005 has been entered.

Response to Amendment

5.   Applicants' amendment for Claims 1, 10, and 19 have been fully considered respectfully by the examiner but they are not persuasive.

6.   The Examiner is maintaining the 35 USC § 103 Rejections. For the Applicants' convenience they are listed as following, with the amendments requested by the Applicants.

Response to Arguments

7.   Applicant's arguments with respect to claims 1, 10, and 19 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

8.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9.   Claims 1, 2, 4-8, 10-11, 13-17, 19-20, 22-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over US2003/0079210, by Peter Markstein et al. (hereinafter "Markstein"), in view of U.S. Patent No. 5,875,318 by Langford (hereinafter "Langford").

CLAIM	Markstein / Langford

1. A machine-implemented method comprising:
 	
  analyzing one or more instructions of a program; and
 	
  modifying the program to expand a register set for a routine in the program transparently to execution of the program, wherein an expanded register set is to store data used to analyze the execution of the program.
	Markstein teaches the feature of analyzing a program, in Markstein, paragraph 48, "the entire **source code is analyzed** to generate a control flow graph" (*analyzing instructions of a program*) ; Markstein also teaches 'expand a register set', in paragraph 6, last two sentences, "A prologue and epilog typically includes code executed before and after a **subroutine** or **program**. For example, when a prologue is executed stack space may be allocated for **saving necessary context**, such as **saving callee-saved registers**. When an epilog is executed, the compiler may **restore any necessary registers**."; in paragraph 51, "**Additional register allocation** may be needed if a single intermediate level instruction expands into more than one target level instruction". For the register is used store data used to analyze the execution of the program feature, see Markstein's paragraph 0040, "For each intermediate-language operation, **each operand is analyzed** to determine whether it is **already stored in a real register** If the operand is stored in a real register, then the **register is marked as used-in-current-operation**, as well as busy. If the operand is not stored in a real register, a

real register is allocated from registers that are not marked as used-in-current-operation. (*storing data for transparently to execution analysis*)." Markstein teaches all aspects of claim 1, but he does not mention 'modifying program' and 'storing data used to analyze the execution of the program' specifically, however, Langford teaches it in an analogous prior art. See Langford's column 1, lines 44-45, "A '**self-modifying code**' is a technique used by programmers to increase the processing speed of executable programs." Also see Langford's FIG. 2, and column 3, lines 4-15, "This **modification** may be in the form of incrementing or using a different register to store a particular data each time the **code is executed**. For example, the basic instruction of instruction (m) may be to copy the contents of a register into memory using another register and an offset to form the address of the memory store such as: copy C.sub.x D.sub.s i, where C.sub.x is the register from which the data will be copied, D.sub.s is the register containing the base address of the data and (i) is an offset to D.sub.s. Instruction 12 may be incrementing the offset (i). Therefore each time the code is executed, the content of register C.sub.x is copied into a different memory location (*modifying program and using register to store data for program execution analysis*)."

It would have been obvious to a person of ordinary skill in the art at the time of the invention was made to supplement Markstein's disclosure of the analyzing program and expanding registers by modifying program and using register to store program data taught by Langford, for the purpose of minimizing performance

degradation (see Langfor's title).

2. The method of claim 1, comprising:
    identifying one or more register moves for the expanded register set; and
    modifying the program to perform the identified one or more register moves.

For the feature of claim 1 see claim 1 rejection. In Markstein paragraph 9, "**identifying** an operand from the intermediate code to store in a real **register**; and selecting an appropriate class of real registers to **store the operand**." See claim rejection 1 has for 'modifying program' feature.

4. The method of claim 1, wherein the modifying the program comprises modifying the program to expand a register set for a callee routine of the program.

For the feature of claim 1 see claim 1 rejection. Again, in Markstein paragraph 51, "**Additional register allocation may be needed** if a single intermediate level instruction expands into more than one target level instruction", the additional register (*expand register set*) can be for a **callee** routine or a **caller** routine. See Markstein, paragraph 27, "Different classes of real registers may include **caller-saved registers** and **callee-saved registers**. **Callee-saved registers** are preferably used to store local variables and stack items", also in the same paragraph, "A program may be compiled such that a library **routine** may store a temporary computation in a **caller-saved register**. Local variables and stack items, which are generally needed for a longer period of time, are stored in **callee-saved registers** (*for a callee routine of the program*)".

5. The method of claim 4, comprising: modifying the program to expand a register set for a caller routine that is to call the callee routine.

For the feature of claim 4 see claim 4 rejection. In Markstein's disclosure cited in claim 4 rejection, it covers both callee routine and caller routine, and the caller routine can call the callee routine.

6. The method of claim 5, wherein the modifying the program to expand a register

For the feature of claim 5 see claim 5 rejection. For the rest of the claim 6 feature

set for the callee routine comprises modifying the program to expand a register set that includes one or more registers of the register set for the caller routine.

see claim 4 rejection.

7. The method of claim 5, comprising:
(a) identifying one or more register moves for the register set of the caller routine; and
(b) modifying the program to perform the identified one or more register moves prior to or upon returning from the callee routine to the caller routine.

For the feature of claim 5 see claim 5 rejection. For the rest of the claim 7 feature see claim 1 rejection.

8. The method of claim 5, comprising:
(a) identifying a register move from a register added to the register set for the caller routine to a register added to the register set for the callee routine; and
(b) modifying the program to perform the identified register move.

For the feature of claim 5 see claim 5 rejection. For the rest of the claim 8 feature see claim 1 rejection.

10. A machine-readable medium having instructions that, if executed by a machine, cause the machine to perform a method comprising:
analyzing one or more instructions of a program; and
modifying the program to expand a register set for a routine in the program transparently to execution of the program, wherein an expanded register set is to store data used to analyze the execution of the program.

Markstein's FIG. 4 shows a 'machine-readable' medium as cited in claim 10. For the rest of the features see claim 1 rejection.

11. The machine-readable medium of claim 10, wherein the method comprises:
identifying one or more register moves for the expanded register set; and
modifying the program to perform the identified one or more register moves.

For the feature of claim 10 see claim 10 rejection. For the rest of the features see claim 2 rejection.

13. The machine-readable medium of claim 10, wherein the modifying the program comprises modifying the program to expand a register set for a callee routine of the program.

For the feature of claim 10 see claim 10 rejection. For the rest of the features see claim 4 rejection.

14. The machine-readable medium of claim 13, wherein the method comprises: modifying the program to expand a register set for a caller routine that is to call the callee routine.

For the feature of claim 13 see claim 13 rejection. For the rest of the features see claim 5 rejection.

15. The machine-readable medium of claim 14, wherein the modifying the program to expand a register set for the callee routine comprises modifying the program to expand a register set that includes one or more registers of the register set for the caller routine.

For the feature of claim 14 see claim 14 rejection. For the rest of the features see claim 6 rejection.

16. The machine-readable medium of claim 14, wherein the method comprises:
    (a) identifying one or more register moves for the register set of the caller routine; and
    (b) modifying the program to perform the identified one or more register moves prior to or upon returning from the callee routine to the caller routine.

For the feature of claim 14 see claim 14 rejection. For the rest of the claim 16 feature see claim 7 rejection.

17. The machine-readable medium of claim 14, wherein the method comprises:
    (a) identifying a register move from a register added to the register set for the caller routine to a register added to the register set for the callee routine; and
    (b) modifying the program to perform the identified register move.

For the feature of claim 14 see claim 14 rejection. For the rest of the claim 17 features see claim 8 rejection.

19. A system comprising:
    a processor to execute instructions; and
    a medium having instructions to analyze

Same as claim 10 rejection.

one or more instructions of a program and
to modify the program to expand a register
set for a routine in the program
transparently to execution of the program,
wherein an expanded register set is to store
data used to analyze the execution of the
one or more instructions of the program.

20. The system of claim 19, the medium having instructions to identify one or more register moves for the expanded register set and to modify the program to perform the identified one or more register moves.	For the feature of claim 19 see claim 19 rejection. For the rest of the features see claim 2 rejection.
22. The system of claim 19, the medium having instructions to modify the program to expand a register set for a callee routine of the program.	For the feature of claim 19 see claim 19 rejection. For the rest of the features see claim 4 rejection.
23. The system of claim 22, the medium having instructions to modify the program to expand a register set for a caller routine that is to call the callee routine.	For the feature of claim 22 see claim 22 rejection. For the rest of the features see claim 5 rejection.
24. The system of claim 23, the medium having instructions to modify the program to expand a register set that includes one or more registers of the register set for the caller routine.	For the feature of claim 23 see claim 23 rejection. For the rest of the features see claim 6 rejection.
25. The system of claim 23, the medium having instructions to identify one or more register moves for the register set of the caller routine and to modify the program to perform the identified one or more register moves prior to or upon returning from the callee routine to the caller routine.	For the feature of claim 23 see claim 23 rejection. For the rest of the features see claim 7 rejection.
26. The system of claim 23, the medium having instructions to identify a register	For the feature of claim 23 see claim 23 rejection. For the rest of the features see

move from a register added to the register set for the caller routine to a register added to the register set for the callee routine and to modify the program to perform the identified register move.

claim 8 rejection.

10.   Claims 3, 12 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over US2003/0079210, by Peter Markstein et al. (hereinafter "Markstein"), in view of in view of U.S. Patent No. 5,875,318 by Langford (hereinafter "Langford"), and further in view of U.S. Patent No. 5, 644,709 by Todd Michael Austin (hereinafter "Austin").

CLAIM	Markstein / Langford /Austin

3. The method of claim 2, wherein the identifying comprises:
  (a) defining one or more move chains for the expanded register set, and
  (b) identifying a sequence of one or more register moves based on the defined one or more move chains.
	For the feature of claim 2 see claim 2 rejection. For item (b), see Langford's column 3, lines 1-3, "FIG. 2 illustrates a block of source code and its resulting translation. Source code 10 is made of a **sequence of instructions** which comprise instruction 12 and instruction (m). Instruction 12 modifies instruction (m). This modification may be in the form of incrementing or using a different **register to store** a particular data each time the code is executed."
	Markstein and Langford teach all aspects of claim 3, but they do not mention 'move chain' specifically, however, Austin teaches it in an analogous prior art. In Austin column 7, lines 19-26, "A **call-chain** is the state of the stack at some point in a program's execution; it is composed of **a sequence of function names**; functions higher in the **call-chain** call (possibly indirectly) the functions lower in the call **chain**; neighbors in the **call-chain** share a

relationship. A partial **call-chain** is a subset of the current complete call-chain, usually taken from the bottom of the complete call chain; partial call-chains are usually employed to reduce storage requirements."

It would have been obvious to a person of ordinary skill in the art at the time of the invention was made to supplement Markstein's and Langford's disclosures of the analyzing program and expanding registers by call chain taught by Austin, for the purpose of adjusting the appropriate counts at calls (Austin column 7, lines 34-35) thus no callee routine would be left out during a program rearrangement.

12. The machine-readable medium of claim 11, wherein the identifying comprises: (a) defining one or more move chains for the expanded register set, and (b) identifying a sequence of one or more register moves based on the defined one or more move chains.	For the feature of claim 11 see claim 11 rejection. For the rest of the features see claim 3 rejection.
21. The system of claim 20, the medium having instructions to define one or more move chains for the expanded register set and to identify a sequence of one or more register moves based on the defined one or more move chains.	For the feature of claim 20 see claim 20 rejection. For the rest of the features see claim 3 rejection.

Conclusion

The following summarizes the status of the claims:

35 USC § 103 rejection: Claims 1-8, 10-17, 19-26

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chih-Ching Chow whose telephone number is 571-272-3693. The examiner can normally be reached on 7:30am - 4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tuan Q. Dam can be reached on 571-272-3695. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Any inquiry of a general nature of relating to the status of this application should be directed to the **TC2100 Group receptionist: 571-272-2100**.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Chih-Ching Chow

Examiner

Art Unit 2192

November 15, 2005

CC

ANTONY NGUYEN-BA
PRIMARY EXAMINER